ASSIGNMENT 9

Text book Assignment: "Hydraulic Systems," pages 10-1 through 10-34.

IN ANSWERING QUESTIONS 9-1 THROUGH 9-4, SELECT THE DEFINITION FROM COLUMN B THAT MATCHES EACH TERM LISTED IN COLUMN A. THE RESPONSES IN COLUMN B MAY BE USED ONCE, MORE THAN ONCE, OR NOT AT ALL.

A. TERMS	B. DEFINITIONS
9-1. Hydraulics	1. The branch of science that deals with the use of air in relation to the mechanical aspects of physics
9-2. Liquid	2. A substance composed of molecules and has the ability to flow easily
9-3. Pneumatics	3. The branch of science that deals with the use of liquids in relationship to the mechanical aspects of physics
9-4. Gas	4. The amount of force distributed over each unit on an area of an object

9-5. In regard to hydraulics and pneumatics, what are the two major differences between liquids and gases?

1. Weights and temperature
2. Colors and weights
3. Temperatures and compressibility
4. Expansion and compressibility

9-6. The basic law of fluids that applies to hydraulic and pneumatic systems is based upon which of the following statements?

1. Pressure applied anywhere on confined liquid is transmitted equally and undiminished only at right angles to the direction of application
2. Pressure applied anywhere on a confined liquid is transmitted through the liquid equally and undiminished in every direction
3. Pressure applied anywhere on a confined liquid multiplies the force only in the direction of application
4. Pressure applied anywhere on a confined liquid is transmitted equally and undiminished only in the direction of application

IN ANSWERING QUESTIONS 9-7 THROUGH 9-9, REFER TO FIGURE 10-2 IN YOUR TEXTBOOK AND THE FIRST BASIC RULE FOR TWO PISTONS USED IN A FLUID POWER SYSTEM.

9-7. What is the applied pressure exerted on a 200-square-inch output piston if a 100-pound force is applied to a 50-square-inch input piston?

1. 2 lb
2. 400 lb
3. 2 psi
4. 400 psi

9-8. What is the applied force on an 8-square-inch input piston if a force of 480 pounds is developed on a 24-square-inch output piston?

1. 160 psi
2. 160 lb
3. 480 psi
4. 480 lb

9-9. What is the surface area (in square inches) of an input piston if an input force of 60 pounds can lift a 480-pound load with an 80-square-inch output piston?

1. 6
2. 10
3. 60
4. 80

IN ANSWERING QUESTIONS 9-10 THROUGH 9-12, REFER TO FIGURE 10-2 IN YOUR TEXTBOOK AND THE SECOND BASIC RULE FOR TWO PISTONS IN THE SAME FLUID POWER SYSTEM.

9-10. How many inches will an output piston with a 24-square-inch surface area be moved if the input piston with a 6-square-inch surface area is moved 4 inches?

1. 24
2. 6
3. 4
4. 1

9-11. What is the area (in square inches) of an output piston that is moved 18 inches in reaction to a 12-square-inch input piston being moved 3 inches?

1. .5
2. 1.0
3. 1.5
4. 2.0

9-12. To produce a 10-inch movement on an output piston with a 5-square-inch surface area, how far (in inches) must an input piston with a 2.5-square-inch surface area move?

1. 12.5
2. 20.0
3. 25.5
4. 50.0

9-13. The force in any hydraulic system is generated by what component?

1. Accumulator
2. Actuating unit
3. Pump
4. Motor

9-14. A pump only causes the flow of fluid, thus the amount of pressure created in a system is not controlled by the pump, but by the workload imposed on the system and the pressure regulating valves.

1. True
2. False

9-15. Pumps are classified as a fixed delivery or a variable delivery and can be further divided into which of the following classifications?

1. Gear, piston, or vane
2. High pressure or low pressure
3. Piston, motor, or accumulator
4. Rotary, reciprocating, or centrifugal

9-16. What type of gear is illustrated in figure 10-3 of your textbook?

1. Helical
2. Spur
3. Crescent
4. Herringbone

9-17. Fluid is trapped between the teeth and the housing at the inlet port, and is carried around the housing to the outlet port. As the teeth mesh again, the fluid is displaced out the outlet port. What does this produce?

1. A partial vacuum that aids in lubrication of the pump
2. A low-pressure area to assist the gravity flow of the liquid
3. A positive flow of the liquid into the system
4. A means for the drive gear to rotate the driven gear hydraulically

9-18. Tooth one in figure 10-6 of your textbook is in mesh with space one at the start of the first revolution (view A). Following three complete revolutions, which tooth will be meshing with space one?

1. Tooth two
2. Tooth three
3. Tooth four
4. Tooth five

9-19. When a vane pump is operating, what forces the vanes against the housing wall?

1. Vane springs located in each slot
2. Centrifugal force acting on each vane
3. Hydraulic pressure on the backside of each vane
4. Magnetized vanes and a ferrous metal housing

9-20. Reciprocating pumps are based on three operating principles. Two of these operating principles are described by which of the following characteristics?

1. Balanced and unbalanced
2. Constant volume and variable volume
3. Closed loop and open loop
4. Axial piston or hand pump

IN ANSWERING QUESTIONS 9-21 THROUGH 9-26, REFER TO FIGURE 10-8 IN YOUR TEXTBOOK.

9-21. What is the function of the universal link in a constant volume pump?

1. To drive the cylinder block
2. To hold the cylinder at an angle to the driven shaft
3. To force the fluid out of the pressure port
4. To push the pistons into the cylinder bores

9-22. In this constant-volume piston pump, the volume output is determined by the angle between which of the following components?

1. The piston and drive shaft
2. The point of attachment and the universal link
3. The universal link and the drive shaft
4. The cylinder block and the drive shaft

9-23. As the piston moves toward the bottom of its stroke, what causes the cylinder to fill with fluid?

1. A boost pressure applied on the fluid and fluid expansion valve
2. A positive pressure locked in by a check valve and the pressure of the accumulator
3. A partial vacuum created by the movement of the piston and the gravity pressure
4. A vacuum created by an actuating control

9-24. When the piston is rotated toward the upper position, what happens to the fluid?

1. It is drawn into the intake point
2. It is released by the drive shaft
3. It is pressurized by the cylinder block
4. It is forced out of the pressure port

9-25. The constant-volume pump is cooled and lubricated by what means?

1. Fluid flow and air from a cooling fan
2. Fluid flow and case pressure
3. Engine radiator coolant and case pressure
4. Circulation of fluid through a heat exchanger and reservoir

9-26. The relief valves that prevent buildup of excessive case pressure are normally set for what psi?

1. 10
2. 15
3. 20
4. 25

9-27. The pressure-compensating valve in a stroke reduction type of variable-volume piston pump, such as the ones illustrated in figures 10-9 and 10-10, uses what process to control output volume?

1. System pressure to control and vary the piston stroke
2. Control of the fluid inlet volume
3. A system bypass within the pump
4. All of the above

9-28. An advantage of using the variable-volume pump in a hydraulic system is the elimination of which of the following components?

1. Pressure regulator
2. Relief valve
3. Boost pump
4. Heat exchanger

IN ANSWERING QUESTIONS 9-29 THROUGH 9-31, REFER TO FIGURE 10-11 IN YOUR TEXTBOOK.

9-29. What happens when the pump handle in view A is moved to “the” right?

1. Check valve A opens, check valve B closes, and fluid flows out through the outlet port
2. Check valve A opens, check valve B closes, and fluid flows in through the inlet port
3. Check valve A closes, check valve B opens, and fluid flows out through the outlet port
4. Check valve A closes, check valve B opens, and fluid flows in through the inlet port

9-30. In view A, why is fluid discharged through the outlet port when the piston is moved to the left?

1. The piston rod makes the inlet chamber smaller than the outlet chamber
2. Check valve A opens and lets fluid from the larger inlet chamber flow into the smaller outlet chamber and through the outlet port
3. Check valve B opens and admits fluid to the inlet port and the outlet port through valve A
4. Check valve A closes and lets fluid (in the larger inlet chamber) flow into the smaller outlet chamber and out through the outlet port

9-31. What would be a result in the actions of the pump in view B if check valve B could not close completely?

1. Fluid from the smaller chamber would be allowed to flow back into the larger chamber
2. Fluid from the larger chamber would be allowed to flow freely into the outlet port
3. Fluid under pressure in the outlet port would be allowed to flow back into the inlet port
4. Fluid under pressure would be allowed to flow from the larger chamber back into the inlet port

9-32. Actuators are generally classified as to what two common designs?

1. Cylinder or motor
2. Ram or piston
3. Single or double-acting
4. Gear or vane

IN ANSWERING QUESTIONS 9-33 THROUGH 9-35, REFER TO CYLINDER-TYPE ACTUATORS.

9-33. What is the primary difference in the use of the ram and piston-type cylinders?

1. The ram type is used primarily for push and pull application, and the piston type is used for push
2. The ram type is used for push application only, and the piston type is used for push and pull applications
3. The ram type is used for applying a rotary motion, and the piston type is used for reciprocating motion
4. The ram type is used to drive hydraulic pumps, and the piston type is used as directional valves

9-34. What is used in many applications on single-acting pistons to provide piston movement in the direction opposite that achieved with fluid pressure?

1. Spring tension
2. Gravity
3. Both 1 and 2 above
4. Reverse pressure

9-35. Why is a double-acting piston referred to as an unbalanced actuating cylinder?

1. One fluid port is larger than the other
2. The fulcrum point within a cylinder changes as the piston rod extends or retracts
3. The piston slides along the piston rod outer surface causing friction
4. The blank side of the piston has a larger working surface area than the rod side of the piston because of the cross-sectional area of the rod

9-36. Some hydraulic pumps can be used as hydraulic motors with little or no modification.

1. True
2. False

9-37. Of the three most commnon types of elements used in motors, which is the only one used in pneumatic systems?

1. Gear type
2. Vane type
3. Ram type
4. Piston type

9-38. What is a noteworthy difference between a vane-type pump and a vane-type motor?

1. The vane-type motor is not capable of providing rotation in either direction
2. Vanes in a vane-type motor advance through numerous slots during one rotation of the drive shaft
3. The vane-type motor requires springs of some sort to keep the individual vanes pressed against the housing while the motor is not rotating
4. Vane-type pumps require springs to keep the individual vanes pressed against the housing while the pump is not rotating

9-39. When it is used on CESE in the NCF, how is the axial-piston hydraulic motor used?

1. To assist with heavy loads
2. As a hydraulic pump
3. As an auxiliary drive motor
4. To assist the brakes of the vehicle

9-40. What creates the dynamic-braking effect in an axial-piston pump/axial-piston motor configuration?

1. The motor, when coasting, becomes a pump and attempts to rotate the drive pump, and in turn, the prime mover
2. The plate of the motor is moved to a neutral plane and hydraulic fluid is reverse-ported to the exhaust of the motor
3. The pump reverses direction which allows the motor to coast and allow mechanical braking on the brake shoes
4. The pump causes excessive pressure in the motor's inlet side of the pistons, causing the pump to apply pressure to a mechanical brake pad

9-41. Which of the functions listed below is NOT one of the primary uses of a basic valve?

1. Controlling direction of flow
2. Controlling volume of fluid
3. Filtering fluid flow
4. Regulating fluid pressure

IN ANSWERING QUESTIONS 9-42 THROUGH 9-45, SELECT FROM COLUMN B THE COMPONENT THAT PERFORMS EACH FUNCTION LISTED IN COLUMN A.

A. FUNCTIONS	B. COMPONENTS
9-42. Maintains system pressure between two predetermined operating pressures	1. Check valve
	2. Pressure regulator valve
	3. Selector valve
9-43. Allows fluid flow in one direction only	4. Relief valve
9-44. Safety valve limiting maximum system pressures to prevent over pressurization damage	
9-45. Controls direction of fluid flow to control direction or operation of a mechanism	

9-46. Which of the following valves is the most common type of valving element used in directional control valves?

1. Rotary spool
2. Sliding spool
3. Expanding spool
4. Compressing spool

9-47. The reservoir used in a hydraulic system differs from a receiver used in a pneumatic system only in the external markings.

1. True
2. False

9-48. What is the main purpose for the space above the fluid in a hydraulic reservoir?

1. To prevent drawing atmospheric dust into the system
2. To segregate the outlet fluid from the inlet fluid
3. To allow the fluid to purge itself on air bubbles
4. To cool the returning fluid before it is picked up by the pump

9-49. An accumulator can be installed in a hydraulic system to provide what service?

1. Emergency hydraulic power supply
2. Flow-divider valve
3. Check valve
4. Reservoir air filter

9-50. Filter elements are usually classified by which of the following factors?

1. Type of material used for design and construction
2. Location and purpose within the system
3. Type of fluid used and system operating temperature
4. Type of fluid used and system operating pressure

9-51. The most common hydraulic filter elements used in CESE are what types?

1. Wire mesh and porous metal only
2. Wire mesh, porous metal, and micronic only
3. Wire mesh, micronic, porous metal, and sintered bronze
4. Wire mesh, porous metal, and stainless steel

9-52. How does a micron equate to an inch?

1. One micron is equal to approximately .0000394 inch
2. Three microns are equal to approximately .00012 inch
3. Four microns are equal to approximately .00250 inch
4. Five microns are equal to approximately .0001576 inch

9-53. Which type of filter element is not reusable (disposable)?

1. Micronic
2. Wire mesh
3. Porous metal
4. Stainless steel

9-54. The filter design most used in CESE hydraulic systems is of what type?

1. Bypass
2. Nonbypass
3. Full-flow
4. Partial-flow

9-55. The function of the bypass pressure relief valve in a filter housing is to provide what feature?

1. Allowing the fluid to bypass the element in the event the element becomes clogged
2. Allowing the fluid to bypass the element when the system pressure falls below a safe filtering value
3. Regulating the gallons per minutes (gpm) of fluid passing into the main pump
4. Providing an accumulator for pulsating fluid pressures

9-56. A contamination indicator in a hydraulic filter assembly uses what principle of operation?

1. A piston between the fluid and compressed nitrogen isolates the two systems to prevent aeration of the hydraulic fluid
2. The surface area on the face of the piston will be a greater value than the surface area on the backside of the piston because of the cross-sectional area of the rod
3. The output volume of the filter is controlled by a floating cam plate, which limits the piston stroke according to the back pressure applied to the element
4. The differential pressure built up between the inlet and outlet ports vice of the filter

9-57. Which of the following components is NOT a requirement for a basic hydraulic system to operate?

1. Pump
2. Accumulator
3. Control valve
4. Reservoir

IN ANSWERING QUESTIONS 9-58 THROUGH 9-60, REFER TO FIGURE 10–35.

9-58. With the selector valve in the position indicated, fluid is returned to the reservoir from what component?

1. The selector valve via the power pump
2. The power pump via the selector valve
3. The top of the actuating cylinder
4. The bottom of the actuating cylinder via the selector valve

9-59. The pressure regulator and the check valve perform which of the following functions?

1. They relieve the workload on the pump and make the system more durable, safe, and efficient
2. They relieve the pressure in the system in case of a mechanical failure
3. They enable the system to use a variable-volume pump
4. They determine the direction of the flow of fluid from the actuating cylinder

9-60. What is the purpose of the hand pump?

1. To maintain system pressure between two predetermined limits
2. To act as an emergency power source
3. To trap fluid to maintain pressure until a mechanism is actuated
4. To provide a buffer to suppress hydraulic surges

9-61. When the pump is idling, what is the path of fluid flow in an open-center hydraulic system?

1. Reservoir, selector valves, actuating cylinder, pump, selector valves, and reservoir
2. Reservoir, pump, selector valves, actuating cylinder, selector valves, and reservoir
3. Reservoir, selector valves, pump, actuating cylinder, and reservoir
4. Reservoir, pump, selector valves, and reservoir

9-62. A closed-center hydraulic system differs from an open-center hydraulic system in that the closed-center system has

1. fluid flowing under no pressure when its pump is idling
2. its selector valves arranged in parallel vice in series
3. a constant-volume pump
4. no need for a pressure regulator

9-63. Sluggish or erratic operation of a hydraulic system generally results from what cause?

1. Defective mechanical linkage
2. Defective electrical linkage
3. External or internal leaks
4. Insufficient fluid in the system

9-64. What is the key to a hydraulic system's dependability?

1. The proper setting of relief valves and gauges
2. The replacement of identical components
3. The attention given to the cleanliness of the repair facility
4. A sound understanding of the system's operation

9-65. Before reassembling a hydraulic valve, you should lubricate the internal parts by what means?

1. A thin coat of general-purpose oil
2. A thin coat of high-temperature grease
3. A clean lubricating oil
4. The specified type of hydraulic fluid

9-66. Particles, such as dust, rust, and weld splatter, are considered what type of contamination?

1. Restrictive
2. Nonabrasive
3. Abrasive
4. Sludge

9-67. At what time does the air filter of a single-acting hydraulic ram prevent ingesting of airborne contaminates?

1. During the outward stroke only
2. During the return stroke only
3. During the outward and return stroke
4. While in neutral

9-68. Chemical contamination of hydraulic liquid by oxidation is indicated when the liquid contains which of the following materials?

1. Sludge
2. Asphaltine particles
3. Organic acids
4. Each of the above

9-69. At what temperature, in degrees, does hydraulic fluid begin to break down in substance?

1. 200°
2. 250°
3. 300°
4. 350°

9-70. Diesel fuel is not to be used as a flushing medium in hydraulic systems.

1. True
2. False